

WHAT IS CLAIMED IS:

1. A method for manufacturing a semiconductor device comprising the steps of:

5 forming a first insulating film on a substrate;
 forming a second insulating film on the first insulating film;
 and

 forming a gate electrode on the second insulating film; wherein
 the step of forming a second insulating film comprises a first
10 step of supplying film-forming materials and making the film-forming
 materials adsorbed on the first insulating film; a second step of purging
 the film-forming materials that has not been adsorbed; a third step
 of supplying oxidants to oxidize the adsorbed film-forming materials;
 and a fourth step of purging the oxidants that has not contributed
15 to oxidization;

 the step of forming a second insulating film is repeated for a
 plurality of cycles continuously; and

 the purging time in the fourth step in the initial predetermined
 number of cycles is made longer than the purging time in the fourth
20 step in following cycles.

2. The method for manufacturing a semiconductor device according
 to claim 1, wherein the purging time in the fourth step in initial
 predetermined cycles is 5 to 15 times longer than the purging time
25 in the fourth step in following cycles.

3. The method for manufacturing a semiconductor device according
 to claim 1, wherein either HfO_2 , HfAlO_x , HfSiO_x , or a nitride thereof
 is used as the second insulating film.

4. The method for manufacturing a semiconductor device according to claim 1, wherein the initial predetermined number of cycles is 10 to 20.

5 5. A method for manufacturing a semiconductor device comprising the steps of:

forming a first insulating film on a substrate;

forming a second insulating film on the first insulating film;

and

10 forming a gate electrode on the second insulating film; wherein the step of forming a second insulating film comprises a first step of supplying film-forming materials and making the film-forming materials adsorbed on the first insulating film; a second step of purging the film-forming materials that has not been adsorbed; a third step
15 of supplying oxidants to oxidize the adsorbed film-forming materials; and a fourth step of purging the oxidants that has not contributed to oxidization;

the step of forming a second insulating film is repeated for a plurality of cycles continuously; and

20 the purging time in the second step in the initial predetermined number of cycles is made longer than the purging time in the second step in following cycles.

6. The method for manufacturing a semiconductor device according
25 to claim 5, wherein the purging time in the second step in initial predetermined cycles is 5 to 10 times longer than the purging time in the second step in following cycles.

7. The method for manufacturing a semiconductor device according
30 to claim 5, wherein either HfO_2 , HfAlO_x , HfSiO_x , or a nitride thereof is used as the second insulating film.

8. The method for manufacturing a semiconductor device according to claim 5, wherein the initial predetermined number of cycles is 5 to 20.

5 9. A method for manufacturing a semiconductor device comprising the steps of:

forming a first insulating film on a substrate;

forming a second insulating film on the first insulating film;

and

10 forming a gate electrode on the second insulating film; wherein
the step of forming a second insulating film comprises a first
step of supplying film-forming materials and making the film-forming
materials adsorbed on the first insulating film; a second step of purging
the film-forming materials that has not been adsorbed; a third step
15 of supplying oxidants to oxidize the adsorbed film-forming materials;
and a fourth step of purging the oxidants that has not contributed
to oxidization;

the step of forming a second insulating film is repeated for a
plurality of cycles continuously;

20 the purging time in the fourth step in the initial predetermined
number of cycles is made longer than the purging time in the fourth
step in following cycles; and

the purging time in the second step in the initial predetermined
number of cycles is made longer than the purging time in the second
25 step in following cycles.

10. The method for manufacturing a semiconductor device according to claim 9, wherein

the purging time in the fourth step in initial predetermined cycles
30 is 5 to 15 times longer than the purging time in the fourth step in
following cycles; and

the purging time in the second step in initial predetermined cycles is 5 to 15 times longer than the purging time in the second step in following cycles.

5 11. The method for manufacturing a semiconductor device according to claim 9, wherein either HfO_2 , HfAlO_x , HfSiO_x , or a nitride thereof is used as the second insulating film.

10 12. The method for manufacturing a semiconductor device according to claim 9, wherein the initial predetermined number of cycles is 5 to 20.

13. A method for manufacturing a semiconductor device comprising the steps of:

15 forming a first insulating film on a substrate;
forming a second insulating film on the first insulating film;
and
forming a gate electrode on the second insulating film; wherein
the step of forming a second insulating film comprises a first
20 step of supplying film-forming materials and making the film-forming
materials adsorbed on the first insulating film; a second step of purging
the film-forming materials that has not been adsorbed; a third step
of supplying oxidants to oxidize the adsorbed film-forming materials;
and a fourth step of purging the oxidants that has not contributed
25 to oxidization;

the step of forming a second insulating film is repeated for a plurality of cycles continuously; and

the supply quantity of the oxidants in the third step in the initial predetermined number of cycles is made more than the supply quantity
30 of the oxidants in the third step in following cycles.

14. The method for manufacturing a semiconductor device according to claim 13, wherein the supply quantity of the oxidants in the third step in the initial predetermined number of cycles is made 2 to 3 times more than the supply quantity of the oxidants in the third step in
5 following cycles.

15. The method for manufacturing a semiconductor device according to claim 13, wherein either HfO_2 , HfAlO_x , HfSiO_x , or a nitride thereof is used as the second insulating film.

10 16. The method for manufacturing a semiconductor device according to claim 13, wherein the initial predetermined number of cycles is 5 to 20.

15 17. A method for manufacturing a semiconductor device comprising the steps of:

forming a first insulating film on a substrate;

forming a second insulating film on the first insulating film;

and

20 forming a gate electrode on the second insulating film; wherein the step of forming a second insulating film comprises a first step of supplying film-forming materials and making the film-forming materials adsorbed on the first insulating film; a second step of purging the film-forming materials that has not been adsorbed; a third step
25 of supplying oxidants to oxidize the adsorbed film-forming materials; and a fourth step of purging the oxidants that has not contributed to oxidization;

the step of forming a second insulating film is repeated for a plurality of cycles continuously;

30 the supply of the oxidants in the third step is separated to a plurality of times; and

the number of times for supplying the oxidants in the third step in the initial predetermined number of cycles is made more than the number of times for supplying the oxidants in the third step in following cycles.

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18. The method for manufacturing a semiconductor device according to claim 17, wherein the number of times for supplying the oxidants in the third step in the initial predetermined number of cycles is made 2 to 3 times more than the number of times for supplying the oxidants in the third step in following cycles.

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19. The method for manufacturing a semiconductor device according to claim 17, wherein either HfO_2 , HfAlO_x , HfSiO_x , or a nitride thereof is used as the second insulating film.

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20. The method for manufacturing a semiconductor device according to claim 17, wherein the initial predetermined number of cycles is 5 to 20.